WIND POWER AS A NEIGHBOR: EXPERIENCE WITH TECHNIQUES FOR MITIGATING PUBLIC IMPACTS WEBINAR

December 7, 2011

Coordinator: Welcome and thank you for standing by. At this time all participants are in a listen-only mode. Today's conference is being recorded if you have any objections you may disconnect at this time.

And now I'd like to introduce your host Mr. Bob Grace of Sustainable Energy Advantage Principle Investigator of the NEWEEP Project. Sir you may begin.

Robert Grace: All right thank you very much. Welcome to our sixth Webinar for the NEWEEP Project the New England Wind Energy Education Project. Today's Webinar in on the topic of the Wind Power as a Neighbor. We'll be talking about our experience with the techniques that are available for mitigating public impacts.

We have a large crowd registered for today. We've had over 500 registries many of which are just coming into the Webinar now. And so let's move forward.

I'm going to start with just a very brief overview of the NEWEEP Project. Many of you have participated in our past Webinars and conference. But basically NEWEEP is a project that is designed to accomplish a couple of things. To provide siting decision makers and the potentially impacted public with as objective information as possible on which to make informed decisions about proposed new wind projects throughout the New England region.

And the focus to accomplish this is by collecting and disseminating information that's accurate, objective and up to date on the critical issues that

are impacting the public acceptance, the market acceptance of wind projects that are proposed throughout the region. And hopefully by doing so this process can be part of a broader need to enhance the region's public acceptance of wind energy generation where appropriately sited.

Why is NEWEEP important? Well as most of you are probably aware wind turbine siting in New England is a very complicated process. With any infrastructure changes always perceived as threatening and the public objectives that are behind wind power and which wind power impacts can often conflict. And again as many of you are aware this can lead to heated debates.

The best decisions can come from having decision makers have access to accurate information and accurate understanding of the issues as well as the people that are in communities which will be impacted. There is a lot of information available in those communities that conflicts coming from both project sponsors and opponents often drowning out the voices of those who are simply looking for facts to make the decisions. A lot of that information has both valid and baseless concerns that are commonly voiced.

And so part of our objective here is to highlight what's known about those that are valid and provide as much information in which to address how to address those concerns.

There's also a lack of enough independent data scientific peer review data. We're trying to bring to the floor what data is available and highlight where more data is needed and hopefully get away from what we're seeing as a trend of decisions being increasingly made based on fear and hyperbole rather than good data and facts. And hopefully we're also part of a process of turning

down the volume. There's a lot of emotion and that tends to crowd out the opportunities for decision makers to consider the facts.

So the bottom line for the NEWEEP Project has been good information leads to good decisions and we try to help bring some of that good information to the forefront.

The velocity of NEWEEP is one of objectivity. Obviously objectivity is in the eyes of the beholder but basically the project has been framed as one in which the technology that wind energy has benefits but not every place is the right place for wind. And the frame and principles are that the consequences of wind power are rarely as dyers made up by organized opponents and they're often not as free of consequences that this proponents would hope and would sometime represent.

So all of the individuals involved with planning and executing the NEWEEP Project have approached this activity from the perspective of what if this - what if there was a project that was proposed in our community if we were in your shoes what would we want to know?

So with that as background the NEWEEP Project has been a two year DOE funded project Department of Energy funded project that is wrapping up now. It's concluding with this Webinar. It's been run by Sustainable Energy Advantage, NREL National Renewable Energy Labs and a steering committee. We have conducted six Webinars this being the last of them as well as full day conference this past June.

Information from the past Webinars and the conference is available online on the New England Wind Forum Web site. The link is presented here. And the material from this Webinar will be posted by approximately December 21.

So far NEWEEP has accomplished a lot between the (regis) - the Webinars and the conference. We've had over 25 hundred registrants participate. They're definitely some double counting in there but gives you a sense of the scales of the participation. And based on post Webinar surveys we have understood that most participants have felt that the information provided was fairly unbiased and that's really coming from a on a one to five scale either people that felt that the information was neutral or slightly biased towards wind, slightly biased away from wind.

Over 70% of the conference attendees left with much better - feeling much better informed than when they went in. The project is advanced at dialogue and fill the need and provided fair information to allow people to make better decisions. And so we wanted to thank Department of Energy's Wind and Water Power Program and the Golden Colorado field office for the funding. And after our speakers today we'll talk just a little bit about what comes next with NEWEEP.

So from there let's tee up our speakers. Today's Webinar is on Wind Power as a Neighbor Experience with Techniques from Mitigating Public Impacts. Our speakers and in the order in which they will speak are Charles Newcomb from the Wind Technology Deployment Supervisor at National Renewable Energy Labs he'll be talking about wind energy managing project impacts. Then John Knab the Town Supervisor from Sheldon, New York we'll talk about his experiences of project discussion High - the High Sheldon Wind Farm mitigation efforts and lessons learned.

And then Nils Bolgen, the Program Director from Massachusetts Clean Energy Center will talk about examples of mitigations steps taken by wind project sponsors.

So just to give an overview here Mr. Newcomb will introduce a lot of the tools and issues associated with impacts and their mitigation. Mr. Knab will talk from the perspective of a large wind farm and as one of the individuals who had to make decisions and depart the decision on whether to allow and how to mitigate impacts of that large wind farm. And then Mr. Bolgen will be focusing for the most part on community scale projects.

So at this point I'm going to turn control - actually before we do I did want to tee up one more thing at the end of the Webinar we will be welcoming questions for the panelist. Now we understand that there are a lot of people that are very passionate about the subject matter but it's very important to us to encourage a respectful dialogue and as such and we do not allow individuals to monopolize our scarce time. Again we have several hundred participants here we want to get to all the questions.

So the way we deal with questions is as follows. On your Webinar interface participants may pose questions hopefully (synch) questions in writing using the Webinar's Q&A Chat Box up at the top you should see a choice that says, Q&A. To ask a question you need to click that Q&A. When you're asking the question and typing the question we would appreciate if you would identify yourself at the beginning of the question.

So just your name, the organization or feel free to say, member of the public and your state. It's okay if you wish to remain anonymous but it would be helpful if you could at least provide your first name and your state so you know when your question's being asked. And then this is very important make sure you click Ask afterwards. If you don't click Ask it doesn't show up on our screen and we don't get to see it.

Please if you could limit yourself to one question each. There are hundreds of participants registered and we want to try to get it in everybody's questions. At the end of the session the questions will be posed they'll be read by myself in the order asked until we run out of questions or time whichever comes first. We're not going to screen or prioritize the questions we're going to try to get to them all. We may skip questions if we feel that they've been already been asked and answered.

So I'll come back to this and we'll have this - these instructions up on the site when it's time for Q&A but if you have questions that you think of as we go then you can be answering them as we go and they'll be among the first to be read.

So from there we'll turn it over control to Mr. Charles Newcomb National Renewable Energy Labs. Charles has 15 years in the wind industry in which he's conducted wind technical evaluations, applications testing, performance testing. He's served as an engineering and technical resource for a number of federal agencies and led a technical team developing the technical regulations for the US Department of Agricultures Renewable Energy programs.

He's worked as a Managing Director of Operations and as a Chief Technology Officer at different wind manufacturing development companies where he's managed project origination, equipment procurement, project development and fleet management. Today Charles supports the DOE's Wind Powering America Deployment Program focusing on regional, agricultural and economic development impact, outreach and wind for schools.

So Charles we're going to turn it over to you and all yours.

Charles Newcomb: Thank you Bob greetings everyone. So launching straight in I wanted to put a word out for the Department of Energy and to that regard one of the questions would be what (are) of Energy's role with renewable energy? And if you look through the Department of Energy's Mission Statement there's a few statements in there. But the one that's relevant to today's conversation is the mission to advance the national economic and energy security of the United States.

So that's looking at energy diversity trying to figure out how do we expand beyond traditional fuels and methodologies and that includes wind energy. The National Renewable Energy Laboratory's roles as one of the Department of Energy's research labs focus on renewable energy our role here is to discover and quantify and share what we learn about renewable energy. So sometimes that's research and that's - we can either be doing it directly or we can be sponsoring it through universities or other partnerships.

And that can be in basic sciences, it can be jobs and economic development impacts it can be in policy implications. We can do testing here where we're looking at performance or (acoust) admissions from wind turbines. And again it's this - we have a pretty strong analytical group that looks at the jobs and economic development impacts of wind which is a pretty important decision variable when you're looking at bringing wind into your region because obviously the play from the local and regional and safe perspective is what's in it for us. And not just energy security but what's in it from the revenue perspective.

And then finally we also do a fair amount of research both direct and sponsoring in collaboration with other laboratories about how do you put this equipment in? Where do you put it in? What does it look like? And how do people perceive it? And how do the grids perceive it?

So whenever you're thinking about those kinds of issues about how to - how are people going to look at something? How are people going to approach something? There's always a balance. There's a push pull as with so many things. And so on one hand you've got as an engineer I tend to bound the equation and that's just kind of what happens when you - when you're an engineer. So on one perspective is if you let the impacts drive everything and you say, we're going to make an airplane that can't fall out of the sky it's going to be so heavy that it won't fly or if it's perfectly safe.

On the other hand if you ignore the impacts then it's - it ends up as a real problem because you have so much push back later on that your industry falls flat. So you got to kind of work in those margins a little bit of saying, okay so how do we balance the notion of we're looking for - excuse me - a more diverse energy blend but we're trying to minimize our impacts recognizing that each thing we do to minimize our impact has a cost associated with that.

So we kind of have this mitigation budget that we can work within and when we get too far into that budget then the project doesn't work anymore. And certain places as Bob mentioned are agreeably, absolutely not appropriate for wind energy so you wouldn't put a wind turbine in the Grand Canyon for example not that it would work down there but that's a specific place that's been carved out because of its natural beauty. When you have areas like that there's a very compelling argument not to promote development in those kinds of areas.

So again it's our goal and NEWEEP's goal is to find and express this workable balance where the benefits of the technology of the investment of the technology and the construction of these wind farms or projects is balanced with minimizing or avoiding impacts where possible.

So thinking about this a little bit when - I'm imaging there's a lot of novel voices on the phone today who are thinking well what is the impact and why do these things have impact? Some people will be very familiar with it and some people will be less familiar. So please bear with me while I bring everyone up to speed. There's a few fundamental elements about wind projects and first of all is that they're out there to make power. They're not out there as statutes. They're not there as ornaments to the future.

They actually are a substantial capital investment tens of millions of dollars, billions and billions of money spent every year in this industry. So it's a real investment. And thus it has real revenue streams. It has income that comes off it for the investors as well as for the locales where these projects go in either in terms of direct tax revenue or in payments in lieu of taxes or other methods.

They are in prominent places. They require real estate. They actually are physical objects that need a place to sit to be plugged into the grid and to not tip over so they need a nice wide base. So they need a certain amount of real estate and they need associated infrastructure. So they need roads and sometimes they need buildings to house things. Sometimes they need lay down areas to put the equipment while it's being built or for operations and maintenance. And they convert this wind energy that's abundant and flows across our environment and they convert that into electrical energy.

And that means that something has to move. The wind is moving so there has to be some component that interacts with that moving wind and it has to be something that converts that kinetic energy into electrical energy. So since it's moving it's not static. It is dynamic and it has moving parts. It's a machine. It's a large machine that's sometimes hundreds of feet tall.

So when you think about it from that perspective the general categories of the impacts can be put into two bins. There's this visual one where you've got a large object that's prominent and then anecdote I often use is there's this road on my way to work and back in the old days not that long ago before we had our utility scale machines, we had some small 600 kilowatt wind turbines that were only I think about 50 meters to the hub or so with short blades. But I could see them from 20 miles away if they were running.

If they weren't running I couldn't see them against the back drop of the mountains. But as soon as they were running my eye would focus on that motion and I could see them from 20 some miles away. So our eyes are very perceptive and then audible. And that is not a (ferbe) or anything else that is actually a microphone on a standard dimensioned test platform on a specific orientation for measuring the acoustic omissions of wind turbines themselves. So those are the two general categories.

I want to focus first on the visual impacts and again recognizing that these are tall machines. Most of the utility scale machines are leading the 80 meter tower behind and moving into the hundred meter tower and that's tall. And the rotor diameters, you know, five years ago the standard rotor diameter might be between 80 and 90 meters or so. And now it's moving above 100 meter rotors. So these are, you know, coming up on 300 and some, 328 feet or so to the hub and upwards of 450 feet to the tip of the plate.

So they're visible from great distances. And as such they also cost - cast a shadow and you can see in this image that these shadows can be long. They can also be short and noon on a summer day they can be very short and just oscillate around the tower. But around the spring and late fall and early spring those shadows can get quite long and can cast a shadow that moves on people's property. The good thing is that we generally know where the sun is

going to come up and we can actually calculate with great precision where the turbine shadow is likely to fall in a certain area.

This is a shadow map on the right hand side that sort of shows based on these various colors how many minutes or hours that shadow is going to be in a certain place and space. And it doesn't generally stray from this. And then there's - you get into the debate about well what's the right amount of time for you to be able to flicker on somebody and, you know, sometimes that's zero and sometimes it's 50 hours it depends on who the resident is and what the local guidelines are and whether the person who has the shadow flickering on their house is involved in the project.

So a farmer who has that turbine on their property may be quite happy to have a shadow flicker because every revolution, every shadow passing is another few cents. And it's a constant reminder that they're getting something for it. So the mitigation for the shadow is proper siting. Because we know where these shadows are going to land we can predict them. We can then put these projects or the turbines and site them specifically to avoid flickering on someone's home.

The other one is curtailment. So in fact if we need to get or we'd like to get close enough to a house where it's going to flicker but we have other drivers to be there, there's the option to turn it off while that shadow happens to be right on that person's property or their house. And I just put a number out there which is 50 hours a year which would be a lot out of 87, 60 hours is a fraction of a percent.

So it's something that if there's one house that you're worried about you can imagine that it wouldn't be a real problem to turn that turbine off for a few

hours a year. If there's lots of houses around you and you're turning it off for larger fractions perhaps that's not the right place to put a turbine anyway.

The other one is I mentioned when the farmer is owning a project that's good but the other way to do it is just to bring people into the fold and allow them to benefit from the project directly monetarily. And that's coming in the form of a neighbor payment or some other compensation to acknowledge the fact that you do have a direct impact on them and that there's a tradeoff in there somewhere.

So in terms of the machinery and the moving parts of the wind turbine there's a lot of components to the wind turbine and this cartoon here hardly does justice to it. But it does highlight where the principle sources of sound omission comes from. And they can be broken into this sort of - this whole - the bullets on the left are all the bits and pieces in broad groups that are within the we call it the (Necel) Greek for boat which houses everything up top the whole power assembly up top.

And that's where the principle noises are coming from from the machine side. And then there's the aerodynamic perspective. There are some cooling fans that can be down in the bottom of the tower but those are effectively and audible. However when you look at the system as a whole because these emitting elements are so high in the air, you know, 300 feet in the air their actual contribution to the sound is relatively small and a big contribution to the sound is coming from the aerodynamic noise from the blade itself. And so that's where a lot of the most recent researchers has come from.

That said, there are some things that when we look at a wind turbine we don't even think about the fact that why is it designed that way? Why does it have three blades not five or two or one? And these various elements here are

actually all about sound not all about sound but the first two are about sound. And so the question of up wind versus down wind turbines are up wind not because it's better, faster, cheaper but because it's quieter. When the blade is down wind of a tower there's this little wind tower shadow. And as the blade passes through that shadow there's an audible thump.

And that was kind of a problem with your early machines that they mitigated to a degree by using sort of spiral figures on towers that they used lattice towers and other elements to try to mitigate that. But eventually they just turned the units of the rotors on the upwind side of the tower similarly two versus three blades. In fact two blades is a little cheaper than three blades. But you have to spend the rotor a little faster to get the same amount of energy out it. That means a higher tip speed ratio. That means the higher transport of the tip through the air and that's a little bit louder.

So people have gone to three blades because it's quieter. It also just so happens that it tends to be an (evier) more even look to the eye because it doesn't appear to, you know, appear and disappear as a two bladed rotor can. But really it's a sound issue that drove that design choice.

And then finally the tubular towers we mentioned, you know, it's - that's an esthetic choice. People have commented that large lattice towers look pretty industrial and they'll tolerate them for legacy transmission towers but they're less happy about them for new transmission towers. So you'll notice that a lot of the new transmission towers are actually tubular when they're around people. And that's also driven our wind industry and then the color of the paint.

So that's a visual thing again where white's nice. And actually it's not bright white it's sort of a little bit of a gray white so that it doesn't stand out quite so

brightly. You'll actually notice some towers and I think Intercon is most famous for this where the bottom of the tower has these kind of shades of green that go up about 40 or 50 feet and why would you do that? Well when you see them from a distance against a distant tree line you can't actually see the bottom of the tower against the trees.

And there are those little measures that folks have done to get things going like that. And then in terms of mechanical sound mitigation these are interesting approaches that have been taken over the years that most folks don't even think about. But there's been a lot of effort put into how do we make these things quieter because originally as you're probably are well aware a lot of this development happened in Europe near people first. And near was like within hundreds of feet of a home not thousands of feet.

And so there was a lot of effort put into making these things quieter. The first one was trying to figure out how to actually get the gear box to be quieter because the spur cut gears which is in the bottom here of the two gears let me just highlight them real quickly. This is a spur cut gear here versus the helical gear. Well the spur cut might be less expensive certainly for smaller gear elements but it's louder. And the way to remember this is that, you know, you put your - it doesn't work so well with automatics but it does a little bit. But you current reverse you're using a spur cut gear versus helical in you're in forward gear.

And you would know exactly how much that machine whines when it's in reverse compared to going forward and that's because you've got more teeth sharing the load in a helical situation. So there happens to be a fringe benefit with helical and that the gear boxes last longer but they're also quieter.

We've also got these various isolators here and this is a, you know, a cartoon of a vibration isolator and these we see all over the world but we use them for attaching all the moving mechanical pieces to the bedplate and the other wind turbine components. And it's very effective at keeping the propagation and the vibration into the - from entering the tower and acting as a large resonator. And we do that for the generator itself that's on isolators. We do it for all the pumps and all the fans and other elements that are spinning.

And that has led to a pretty reasonable diminishment and acoustic omissions from the turbine itself. We're using variable speed and cooling systems. We're using these foam pads on the inside of the (Necels) to drop a few decibels off. In certain conditions I was definitely involved in projects where were having systems that would make noise even when the wind wasn't blowing.

And so we figured out that if we had these things make a little bit of noise at the top of the hour as opposed to all the time, that didn't bother people quite so much. It ended up as kind of a neighbor Westminster Abbey if you will. And then appropriate maintenance so there are certain elements of wind turbine that'll make more noise when it's not properly maintained.

So but there's only so much you can do to reduce the noise from a wind turbine directly. You can't make it silent because it's a large kinetic machine. So one of the tricks then is to keep from upsetting the neighbors is to site it properly. And so we're looking to put these turbines sort of in where you get these diminishing returns. So once you get out of a few hundred meters then you're to where the sound level is pretty low and tractable. So especially in comparison to background noise omissions.

And most of you have probably seen these figures that other sources of sound omissions are and we try to get it down to around the sound of a refrigerator as heard from another room. So siting is really important and sometimes you can't site it where you want to sometimes you can. So here's a picture of the (Pete's) wind farm up in Northeastern Colorado. And you can see that there would be a direct line to be drawn between this turbine here in the Northeast and this turbine here (sort of in the) center picture.

But that line is crooked because this turbine here is a little bit further away from the house to make sure that we weren't impacting that house. So that's a nice graphical example of try to push the turbine to some other location.

And then as I mentioned earlier that there's these acoustic omissions from the blade itself. And it just so happens that the noise omissions, the sound omission from the blade goes with the fifth power of the tip speed, the speed of the blade through the air. So by making a small change like even a 15% change in the tip speed by lowering the rotational speed which generally means making the blades longer, you can make the turbine a little bit quieter. So 15% drop in rotor speed ends up about having the sound omission from that turbine.

That's pretty good it does come at a cost because now you have higher torque because power is torque times speed. The lower the speed increase the torque and you don't get it for free. So people are doing that and they also have low speed modes so when there's specific meteorological conditions where sound will propagate unusually far there are manufacturers that will run the turbine at a lower tip speed at a certain production loss.

In contrast to that there are these trailing edge improvements here and they looked at various ones. They looked at putting porosity at this trailing edge on

the blade itself. They looked at adding porosity to the tip or to the leading edge. They've added brushes to the backs of the blades. And what seems to be the current favorite is the serration at the back of the blade. Oh I wonder if I lost my Internet connection we'll see. So these trialing (edge) serrations are actually dropping the noise omissions from the blade itself by three decibels.

Well that just happens to be having in the sound. So if you compare the difference of adding serrations as apposed to changing the entire machine design you can see which one would probably be preferred. So that's a big one.

And I mentioned also sometimes there's conditions where the sound propagates unusually far. And there's also the condition the human condition that we are incredibly perceptive animals perhaps not as good as some other animals out there but we can hear things a long way away. And the interesting thing is a lot of it has to do with our attention.

So if we're having a conversation with somebody we will miss somebody calling our name a few feet away. But if you walk into a restaurant and you're trying to find a friend and somebody who has to barely whisper your name and you can hear them and find them. So a lot of that has to do with how you're feeling about the situation. So when you're not connected to the project you've - do you tend to be less interested in listening to it or seeing it? And that's called the checkerboard affect where you'll get one farmer who's quite happy with the wind farm and may be closer to a turbine than the next farmer.

And yet the more distant farmer is less happy about the nearby wind turbine. And that has a lot to do with being connected. And so that ties back to these interesting and innovative ownership models Rick VanderVeen in (Minn) - Michigan sorry has been pushing this model pretty well. It's a good affect

where you end up coming up with the revenue distribution plan that is independent to a degree of the - of actually having wind turbine on your land or not so that everybody can benefit from the project to a degree.

And we're seeing this in the Northeast more in the form of neighbor payments.

So those things are - those creative solutions are really important to investigate when you can and when needed.

So again when we think about the siting strategy the first step that most developers will take these are the trends that we've observed is that it'll first look to follow the rule of law. If a - if - in following the rule of law and doing everything right they still have unhappy neighbors they'll consider payments in lieu of taxes to the neighborhood to the town in general. They'll also look at these creative ownership models that I mentioned that are being played out in Michigan and Wisconsin and other places.

And then following that they'll move onto neighbor payments to acknowledge that there's different levels of impact depending on your proximity to the wind turbine. And again that engages the neighbor and makes them feel like they're part of the project and it lowers the annoyance level which I think is an important thing.

Curtailment is kind of the last ditch if you can't make it work other ways then you curtail. But you're losing revenue and the minute you start losing revenue it's not in anyone's best interest really.

So there are some other impacts that just briefly glance across in my last 40 seconds or so is that construction is another thing. It's not just the operation of

the equipment it's the installation of the equipment. You have a, you know, a typical crane can involve as many as 20 to 25 semi-loads worth of gear to come in and plus another crane to lift that train. And sometimes that lifting crane that auxiliary crane can take a few truck loads of its own. So there's a lot of that.

There's, you know, hundreds of truckloads of cement that are going to come in and there's roads that need to be built. And there's fugitive dust and there's noise and there's hours of construction and all that kind of stuff that can be a problem. But the way to mitigate it and to handle it is to make it clear. Well here are the benefits again let's - I'll get on the same page with regards to the benefits. And then let's make sure you know what's coming up. Next Sunday this road is going to be closed or, you know, but this over here is going to have ice cream on it or whatever it is.

You know, some - there's going to be some way to compensate for the disruption in your normal life. So a lot of it is good communication and the better developers out there are really quite top notch at communicating with the neighborhood about what they need to do to get the project in.

You know the industry is maturing pretty well on many regards. And on one of them is that - I don't know if you've been watching the front page on about fracking and land leases and how unhappy some property owners are. And we've moved well beyond that we're really far beyond when developers were kind of shooting from the hip. And now they're pretty sophisticated and they know that this is a long term play we're about, you know, only a fraction into the investment that we need to make in the wind energy over the next several decades and they need to play it from a sustainable perspective.

So they've gotten quite good at managing expectations. There are of course wildlife impacts is not the topic of conversation but I didn't want to ignore them completely. And condition based curtailment is definitely up front. A couple of thoughts and condition based curtailment mainly says that, listen we don't have to turn the turbines off if the winds are blowing 40 miles an hour because bats aren't flying at 40 miles an hour that kind of thing. As apposed to well it's bat season let's turn the turbine off all the time.

So those kinds of creative curtailment methods are definitely in play for turbines and projects where there are wildlife concerns. And the folks would rather do that than turn them off (wholesale).

A couple as the last slide a couple of observations. Public benefit correlates well with the project approval that's absolutely true. So to the degree to which the public feels engaged. It feels like they benefit they recognize the benefits, there are benefits to them. That's going to - I'll certainly get them to rally around a project better.

Most of the projects I was involved with were public projects and we had zero pushback on any of our projects because we are very good about communicating and we made sure that we put the projects into the water treatment plant or the school or college or whatever it was to make it work.

And of course in homage to NEWEEP, NREL and DOE is the notion that this credible clear sort of honest broker information is vital to the conversation making sure that as Bob mentioned earlier that the conservation is rationale that it's centered on scientific basis as apposed to here's what we're really worried about. And you'll see this in property values (graphs) of (Ben Hogan) will show in some of his analysis about what happens to the property values after a project is announced before it evens goes in?

Sometimes you'll see a depression of property values because people don't know what to expect. But as soon as the project's in and running everybody goes, oh this isn't at all what we thought it was going to be this totally fine. And project value's completely recovered. So those kinds of things is anecdotes are out there to show that yes a lot of this has to do with getting the right information out there and making sure that people have credible real information.

And again just as a reminder that as we think about mitigation we think about minimizing or impact on the environment and the public around us. It does come at a cost and that it's not a limitless mitigation budget. That at some point the project won't come through. And so if one - if your job as a county administrator or whatever is to bring projects in in economic development that you're paying attention to that so you know that the developer does not have an independent pool of mitigation strategies or budgets.

So Bob I think that was my last slide. I hope I wasn't too far over.

Robert Grace: Thank you Charles. We're going to save questions for the end but if you have questions please feel free to (ask) them or to post them on the Q&A board now.

Our next speaker is John Knab. John is your voice on? Can we hear you?

John Knab: Yes can...

Robert Grace: Right.

John Knab: ...everyone hear me?

Robert Grace: Yes let me just do my introduction and we'll get you going here. John has been the Town of Sheldon Supervisor since 2000. He's been elected seven times most recently last month. Part of that he served as a Town Councilman for 14 years and a Town Judge for 16 years. For most of his career though he worked as a Correctional Officer at the Attica Prison which is ten miles away from the Town Center. John's lived in the same house for 73 years. Is the father of six kids and soon to be nine grand kids. So John's a lot like many of the folks that are online here now that are participating.

He's not a wind expert but he had to become one when a developer came to town. So John please let's hear about your experiences.

John Knab: Okay as you've just said, I've been elected seven times as Town Supervisor. Three of them was during the wind project. I had (unintelligible) windmill people running against me when all three of those elections is a good merger. The town of Sheldon is in the rural (egg) community. We have approximately twenty five hundred and fifty residents in the town and about twice as many dairy cows. It's a diary community, dairy farming.

We have a right to farm it's all in place it's next to farmers so they can keep farming whether it's now and different things that bother people moving out from the city. We don't have an, you know, an abundance of water. We don't have cheap electricity and, you know, with the farming profits dropping off here for the few years the windmills have been a real asset to the town.

Nature employers here in the county are areas of well county governments. We have a local county owned hospital, (unintelligible) eight correctional facilities, (Prestolight) Electric Incorporated and Pioneer Recovery. That's

four different school districts come into the - three different school districts come into our town. So there's people that work at the schools also.

High Sheldon Wind Farm is a 112 and a half megawatt, 75 turbine facility. It began operation in March of 2009 broke ground July 21, 2008. We had real good weather during the construction period. It was - everything went good the roads was hard and dry. The Invenergy the developer had real good contractors they seem to work good with the land owners and, you know, kept everybody advised of what was going on which is the main thing to do because.

You can move onto to the next slide now. We were approached for the first time in 2001 by a developer at one of the sites the best towers in our town we didn't have any log expect at the time we're zoning to regulate these. So we - board the planning board we worked together we got a local law in place. I got it passed at public hearings and everything and it went through. And the first test tower went up in October of 2001. As long as we got, you know, people who were interested in siting test towers that we should get working on the local law to regulate the siting of windmills.

But we started on that late 2001. We adapted a local law in January of 2003 and then we had three different developers approach us. The first one was a company from Spain didn't seem to have an awful lot of backing and they couldn't negotiate contracts for the land owners who leases.

The second one I think had some personnel problems they just didn't seem to hit it off with the land owners. Then Invenergy is the Chicago based firm they're owned - United States owned company. They've started in they've first were building gas and power turbines and then they branched out into wind turbines and I think at the present time they have around 20 wind farms

up and running. Our turbines are all 700 - our local law was that they had to be set back 750 feet from roads or (prep) designs a sound limit of 50 decibels or less at the (prep) design.

And one of things we put in our law that we're real happy with is that all power lines had to be buried at least 42 inches below the surface of the ground. They could not dig up or disturb any creeks or streams. And any time they wanted to cross a road they had to bore underneath it and not dig up the road because there's always a bump or a dip in the road once you never get it compacted back to the same level as the road was before. So we had them - made them bore underneath all the roads also.

It was a long process from when we were first approached in 2003 by Invenergy. We then that the town - the town - at the time the town did not have an engineering firm in place. We interviewed a number of engineering firms and a lot of them hadn't had any experience with wind projects. We settled on Stantec Corporation out of Rochester, New York. Their home offices is in Guelph Ontario. They've had worked with wind projects in the Ontario Providence.

We - as soon as we had the engineering firm contracted with we started working on the seeker which we thought was only going to take maybe eight, nine months but took - been there two years to get it with all the amending and everything it had to be done in different agencies.

And finally in April of 2007 they presented everything to the town board. The wind developer reduced her from 86 turbines to 75 turbines. Each turbine is 396 foot to the tip of the blade. And they at the time had, you know, all the land owners signed up pretty much ready to go. We had a public hearing on it and there was - yes there was opposition but they were real vocal. We've been

taken to court five times. The first time was from conflict of interest because I would say, (unintelligible) was brother-in-law was getting some turbines on his property. He owned sixteen hundred acres in that town.

Their main farm is not in their town but they farm quite a bit of portion of their land in our town. The judge ruled in the town's favor as my wife and his wife are sisters so we're not really blood brother-in-laws. And we've sued for sounds that there was going to be excessive sound and we won that one. And we've sued for data flicker and visual disruption and that was the judge ruled in our favor on that. We were sued for killing and migrating birds and the judge ruled in our favor on that.

Then they took and appealed all their cases and went to Rochester to the Board of Appeals and the judges ruled there in our favor. The reason that the - got the project. So the town board approved it in April of 2007 and the wind company had to get all the permits in place. Had to have a public hearing with the Public Service Commission New York State and then EEC permits which took, you know, a real long time an army core of engineers because they were crossing a couple of (cricks) we had to go through them.

And my own water they, you know, diversion ditches and tiles lines and everything they had to make sure they didn't disrupt any of them. They broke ground in July 21 at 2008. As I said before that in our area it was a dry hot summer. The roads held up real good, negotiated when did the post agreement how we negotiated also a road agreement that roads had to be surveyed be - prior to any construction.

Use of plane to see if there was any ruts in the roads make sure they've been heavy loads to move one of the cranes to eight semi loads and then, you know, each turbine took 30 to 35 loads of cement and plus there was 85 to 90 ton of

(rebier) in each foundation. And then the (wire) and the heavy machines go in the access roads and everything. And our town roads seem to hold up real good.

So they started construction in 2008 and it went along real good. Had a little problem with one turbine that damaged one of the blades. They had to wait a couple of weeks with that or otherwise they would have been on (time) on March 1 of 2009.

Robert Grace: John are we ready to advance to Slide 4?

John Knab: Yes.

Robert Grace: Great.

John Knab: For the project here in New York State our Wyoming County Industrial Development Agency received a one time payment of $210 million or $2.1 million dollars - I'm sorry. This is 1% of the total cost of the project. The project costs $210 million to build here in Sheldon. There's 38 land owners that site the 75 turbines and they've brought anywhere's from one to six turbines to the landowner. We have two landowners that has six turbines. The total of lease payments to the landowners is most of over $600,000 per year.

Non-participating landowners they got paid if they were near the 12 hundred foot step back. There was a eight or ten landownership participants in that. There was a lease agreement for the landowners that had power lines going across their property. They got a one time payment settlement for the first year.

The wind company also through SHIPPA had to do some work on a historical building. The town owned Queen Anne's two room school house that it - we've required back in the 70's historical building. They've renovated that for us and the window's new heating system, new floors, new bathroom, fixed up the wall and the handicapped ramp at a cost of about $95,000. Also we have a town park they black topped the walking path in the park, the basketball court and that was all paid for from the wind project.

Also through SHIPPA this is a historical preservation group the wind company had to do something there. They - we had an old pioneer cemetery that the town maintains. It had a stone wall around it, the wall had deteriorated and fell down and knocked down in many places. They took the wall completely down and rebuilt it the stone wall way around the cemetery. We have another cemetery that had a fence around it. It was cut stone post because of the rods through it for - and they've rebuilt that and leveled off that cemetery and restored it.

Payment in lieu of taxes is we have a kind of a unique situation here in Wyoming County. We had two other wind projects. We decided that instead of splitting it all with the schools and the county that we would do a host agreement up front which each town negotiated with their individual wind firm. We get 80% of the money up front as a host agreement. The other 20% is divided through the payoff. The county, the school and the town chair is their - what their tax rate would have been at the time.

And we have two school districts in our town. They (buy) and get about $105,000 in tax - or payment to the schools. Their county treasure gets about $50,000 and the town gets this year ruled getting $37,000. When we negotiated our host agreement it's a 2% increase every year and it could go as high as 3-1/2% depending on the consumer price index.

Robert Grace: John...

John Knab: So.

Robert Grace: ...if we could move on to the mitigation efforts we're running a little short on time.

John Knab: Okay thank you...

Robert Grace: Thank you.

John Knab: ...the (unintelligible) we changed that from 750 feet to 12 hundred foot. The wind company offered to do that voluntarily so we took advantage of it. There was windmills it was found were going to be problematic. So they were removed from the plan that was 11. One turbine we had to move it was - a (unintelligible) on and we moved it 300 feet back from a homeowner that wouldn't negotiate or sign off on it. There's been some data flicker from the rotation of the blades done.

The developers installed either blinds or drapes for the homeowners TV reception. The developers there's roughly 40 to 50 households that interfered with TV reception they installed Dish satellite reception form, they paid for the basic service and if the landowner or property owner wants additional services they have to pay for that themselves.

When we started negotiating with the wind developer we - here in our law we had a $1 million decommissioning bond had to be posted and that's in affect for 20 years what the contracts for and the $1 million road agreement or bond placed for the road agreement in case they did damage to our roads. The

household set up of hotline if they had two blades (unintelligible) directly to the Chicago office and available 24 hours a day. If there wasn't anyone there you left a message and they returned the call within 24 hours.

The first year they received 12 to 15 calls the calls they ranged sound and (unintelligible) complaints, of people looking for jobs and interested in hosting or having turbines set on their property.

You can go to the next slide now.

Robert Grace: Got it.

John Knab: The process took six years it was considerably longer than I expected at the time. I didn't think it would take that long but it did. Engineering firm, you know, had quite a bit of time finding an engineering firm that had some experience in wind development. I don't think we would have changed anything much in our process. We have a good law in fact and it's any other towns or locations now have used our law.

The wind project turned out, you know, better than I expected it would. It's been a great, you know, economic boost to our town and county it's helped considerably. I guess, you know, at the time we got the (probably) through the highest compensated per megawatt of any most community in New York State when we now there's been a couple more that it's getting equal to (unintelligible) one is trying to get more they haven't settled yet. I'll figure on a day to pull that off.

I just looked at figures here. I've reduced the town taxes. We got our first check in 2008. We had no town taxes for 2009 saved the taxpayers in the Town of Sheldon here a little better than $3-1/2 million in taxes in 2012. The

land owners have taken in about $640,000 a year and that's been a real boost especially when the price of milk had dropped down to, you know, $14, $15 a hundred. It was costing more to produce it than what the farmers were getting for hundred pounds of milk.

And there was (unintelligible) going through during that milk has now gone back up to $21, $22 a hundred so the economy is starting to turn around on, you know, for the (egg).

And I guess that's all I've got is that I think it's been a great thing that's happened to the town and apparently the majority of the landowners feel the same way because I've been elected Town Supervisor or served the longest of any former town supervisors since the town was founded in '08. So I guess I can, you know, one thing it's probably healthy to stay in office.

With that I'm going to sign off.

Robert Grace: Thank you very much John. Very interesting experience I'm sure we'll have lots of questions to be posed to you at the end.

So I guess we will now turn over to Nils Bolgen. Nils is Program Director at the Massachusetts (Clean) and he focuses there on wind generation. In his role he oversees the Mass Clean Energy Center's grant and loan offerings designed to support the development of wind energy in Massachusetts. He has 25 - over 25 years of experience with government sponsored energy efficiency and renewable energy programs. And he's going to take us on a tour through some experiences with mitigation steps taken by a number of the wind project sponsors that he's worked with over the years.

Nils it's all yours.

Nils Bolgen: Okay thank you Bob. We'll start off with a brief description of the Massachusetts Clean Energy Center. We are a quansi public state agency. We have a board of directors appointed by the governor. Our sole mission is to accelerate the successful clean energy development and implementation in Massachusetts. And while doing this to create high quality jobs and provide long term economic growth in the state. We have four major program areas that are shown on this slide here.

They span the value chain for clean energy from sort of ideas in the laboratory through the installation of renewable energy generating facilities. I work in the Renewable Energy Generation Division and we have substantial experience with wind project development that we've gleaned over many years now to our wind energy support programs.

And so today I want to just provide a brief survey of real life examples of steps that have been taken by developers and sort of requested by communities in the wind project siting process. And in some cases look at mitigation steps that we're taking at the operational stage of a project. What do we hope to learn from this? First of all I hope we can illustrate the fluid nature of wind turbine siting. There can be a good bit of give and take back and forth between the developer and the community as you've probably seen from previous presentations.

I want to highlight the importance of doing pre-construction analysis and engaging the community as early as possible in the project development stage. And we also want to provide some examples of mitigation steps that were taken after projects began construction. I think we'll try to highlight some of the challenges that projects face in dealing with that after they've already financed and built their installation.

So let's start with a - just to look at how we at the Mass Clean Energy Center break down the wind energy, wind project development process. It's a little bit artificial and structured because that helps us with our program structures. In real life the development process is a little more fluid than these discrete steps here. But, you know, we start with the earliest stage site assessment and feasibility study. That's just planning and seeing what will work and then doing more detailed studies.

And then finally you get into your permitting process and if successful there and onto procurement of the turbines and construction. As you go through these early stages what we see is the project is refined over time. The number size and location of wind turbines may change. This is the area where you really want to focus your engagement with the community because this is where you can do your mitigating as part of your planning. And from the developer perspective you can do your ongoing analysis of the tradeoffs that you're making.

Well if I have two few turbines maybe my economies of scale has gotten so bad that I have to take some other approach with the project. But those are the - those types of decisions are relatively cheap and easy to make in the planning stage. Whereas if you wait until the operation stage and you're - and at that point public acceptance becomes a feedback scenario then if you have to make operational mitigation there you'll incur costs that probably were unanticipated and that can affect the sort of the overall financial structure of the project.

So let's first take a look at some examples of mitigation steps taken in the planning stage because they are the most important. The most fundamental aspects of a wind project how many wind turbines? Where will they be

located? How visible will they be? How close will they be to me? Those are the things that can be varied at this stage. The obvious mitigation techniques are, you know, reduce the number of turbines, change the location, increase separation distances.

And then importantly what the developer would do is update and refine the acoustic and the shadow flicker studies for example to be able to then report back to the community how the project changes will affect and hopefully reduce impacts on the community. And these are the results reduce the acoustic impacts, reduce the amount of shadow flicker, generally increase the level of comfort among neighbors and all of that feeds into improving the likelihood that you'll get your permits which is what the planning stage is all about.

So for our first example of a project that employed on modifications of the number and the layout of wind turbines we want to look at the new generation wind project in Bourne, Massachusetts. It is not operational it has not been approved yet. To Southeastern Mass just at the very beginning of Cape Cod the project developer in March of this year submitted its initial application to the Cape Cod Commission which is a fairly unique organization that has jurisdiction over a project like this.

They proposed seven wind turbines most of them 2-1/2 megawatts. One was a little smaller. They were proposed to be on 100 meter towers but as new generation wind got into the review process with the Cape Cod Commission and they began to get more focused feedback from the community they - even for, you know, getting very far along in the process they made some modifications. These were also driven by some concerns expressed by the - by NSTAR Electric. They wanted some of the wind turbines that were proposed to be moved further away from some transition - transmission lines.

Initial thinking had been that, you know, the maximum blade tip height that would be sufficient separation from the lines but at some point in the process the utility indicated that they wanted 1-1/2 times the maximum height for some added comfort. This resulted in July of this year in a revision to the project. They reduced the number of turbines to four. They still kept the same turbine sizes but they did increase the minimum separation from residences from, you know, around 800 feet in a couple of cases to at least thirteen hundred feet in all cases.

And so why did they do this? First of all they wanted from the feedback they got they wanted to reduce visibility from the Cape Cod Canal area, the historic area and scenic area, increase separation from one residential area and comply with the electric utilities requirements as I mentioned.

There is an illustration on the left of the initial layout you can see the Red Circles indicate the seven turbine locations. And then on the right you can see where there - several of the turbines were eliminated from the proposal. The outcome though of this sort of project change and concession by the developer it's unclear and it appears to be a little bit tenuous at best. The project is still under review by the Cape Code Commission but the subcommittee that's been reviewing the project has made its recommendation to the full commission and it is that the project not be approved.

We'll I guess learn the ultimate disposition when the full commission meets in January so we'll have to stay tuned for that.

Now let's take a look at another project in the same general area Southeastern Massachusetts it's a project sited on some cranberry bogs. It's called the developer is Beaufort Wind the project name is sometimes called Bog Wind

because of its location Beaufort Wind filed its application to the Wareham Zoning Board of Appeals back in September of 2010. They proposed a total of eight turbines, five on these two bogs called Barker and Parker Mills. Large turbines sort of maybe the current standard for today but 2-1/2 megawatts, hundred meter towers.

They did propose at least fourteen hundred foot separation from residence. But when the project was proposed it was sort of a great backlash in the community. Efforts were launched to modify the local bylaw and the process dragged out. But during that the developer took really a drastic step of reducing the number of turbines to - from eight to two and they increased the separation from residences to at least 17 hundred feet.

There - they selected that distance because that was consistent with a threshold established by the Cape Cod Commission beyond which a project was presumed to be acceptable. So this was the very conservative approach taken by the developer. And again, you know, took these steps in response to vigorous opposition on the basis of acoustics, shadow flicker and veered property values - I'm sorry - concerns about decreases in property values...

Robert Grace: Nils...

Nils Bolgen: ...(unintelligible)...

Robert Grace: ...this is Bob just a point of clarification that you mentioned 17 hundred feet and the slide said, 27 hundred. Could you just clarify there?

Nils Bolgen: ...yes, yes excuse me 27 hundred feet is the revised distance and you can see that here. At the North area of these bogs the Red Circles indicate the three original turbine locations, the Green Circle is the revised location and that

increased separation from this residential area to the West. And it was the same type of scenario over here on the image showing the southern portion of these bars.

Well, before actually getting to this next slide, the ultimate disposition, this project had a long delay because of the bylaw change efforts that took place in the town. That was - it seems to have recently been resolved and so now I expect that this project will be - the zoning board of appeals will take it up again and rule on these two turbine locations, at least.

Now let's switch gears and look at some mitigation steps that we're taking to avoid impacts on air operations, so now it's not neighbors and residences but an airport. The project was valuated and proposed by the Massachusetts Water Resources Authority.

They have a large - a very large waste water treatment plant on Deer Island which is out in Boston Harbor. The original concept was multiple wind turbines in the sort of 1.8 megawatt range. They'd be up to 400 feet high at their maximum tip height. The FAA response was that, no, I'm sorry. It's - given the proximity to Logan International Airport, they wanted to limit the height to manage obstruction clearance.

They wanted to also limit the number of turbines because they were concerned about interference with the airport surveillance radar. On the right here is a - an example of one of the determinations of presumed hazard that the FAA will (send) to a project like this. You get one of these for each proposed wind turbine location.

So negotiations ensued. The FAA did ultimately accept - beginning with two wind turbines. They said they would allow two turbines to be installed and

then evaluate their impact on the airport radar. They had to limit the height to 190 feet above ground level though.

The MWRA, as they're called, they got innovative. They installed two, 600 kilowatt turbines on what are relatively short towers for a turbine of that size. They're approximately 35 meter towers. They could get away with that because you can see in the illustration here, the open water area is to the south, the west and even the northwest of this site.

And that's where the prevailing winds come, so interference from these egg-shaped structures in the back - on the left-hand side which are digesters for sewage sites. You wouldn't get so much interference from those.

These two turbines were installed in our operational in late 2009. It really only took several months for the FAA to decide that they were comfortable with the radar issues and they allowed a third turbine to be installed that went in last year.

And the FAA indicates that they're now ready to approve a fourth wind turbine. That's all well and good for the Mass Water Resources Authority but they are a little frustrated because it would've been more economical for them to install multiple turbines at the same time for (crane mobilization) costs, for example.

Now we want to switch gears a little bit and look at se- a couple of examples of mitigation of impacts that were taken after wind turbine was in operation. The first one is Hyannis Country Gardens, a plant nursery and garden center in Hyannis, Mass out on Cape Code.

We'll just go to the illustration here. The arrow shows the location of the turbine. If you can see it close enough, this aerial shot was taken after the turbine was installed.

Once - this - it's a relatively small turbine - 100 kilowatts on a 47 meter tower. So the shadow (flicker) effects don't extend too far but there were - was at least one complaint after the turbine went operational and the owner elected - or maybe it was (forest), I'm not sure - to mitigate the impact by curtailing operation at the early morning hours when this flicker was a problem.

It didn't have too great a financial impact. But you could imagine that if a larger wind turbine was installed at this location, the flickering facts would be much greater and the amount of mitigation might become sort of untenable.

Now let's take a look at a larger wind turbine that had encountered some more complex issues. This is an aerial view of the waste water treatment plant in Falmouth, Massachusetts.

The town installed a 1.65 megawatt wind turbine at this site the - shown by the thumbtack and indicated by the arrow. The wind turbine provides energy to the municipal waste water treatment plant. It's - the yellow circle indicates a 200 - 2000 foot radius from the project. You can see there are a couple of areas that have residents is - within 2000 feet, the closest of which are about 1300 feet.

This project encountered vigorous concerns about noise expressed by multiple neighbors not long after it was - it became operational. The municipality of the town of Falmouth, to their credit, they did expo- respond very well in terms of engaging with the neighbors, undertaking some additional acoustic monitoring and analysis.

Some of that had back and forth with the Mass Department of Environmental Protection. Based on this, they implemented some temporary measures. Interestingly, they initially elected to curtail operation around the cut in wind speed. The analysis seemed to indicate that the turbine would be more audible at the - those lower wind speeds.

In fact, that didn't really make much difference according to the abutters. Instead, they said the turbine was most audible and most annoying to them at high wind speeds.

So the town implemented some curtailment at high wind speeds and that did seem to provide some reduction in the noise but as you can imagine, the high wind speeds are when you generate most of your electricity. So the economic impact of a long term curtailment at those speeds might be difficult for the town to manage.

This is a work in progress. The - there are additional evaluations going on by consulting firms looking at what the cost of removal and relocation of the turbines would - might be, additional operational curtailment and even exploring some sound mitigation at homes, sound proofing, vibration proofing, things like that.

Mass TPE is doing some additional monitoring at the site. And currently, actually just recently the town (unintelligible) has voted to curtain operation to allow the test run of a second turbine that is also - has also been installed at the site.

So just before we get - move to Fox Island, with Falmouth, all this additional analysis will be feeding into an action that would probably be voted on at Town Meeting this coming spring.

And for the last project, let's look at the Fox Island wind project up in Vinalhaven, Maine. This is a three wind turbine community known project that went - became operational in 2009. They got - this project has a lot of support but some - strenuous concerns have been expressed by multiple neighbors about the noise.

Interestingly, they're not the neighbors that are closest to the project. Some are as far as 2600 feet away. The Fox Island Cooperative has taken an aggressive stance in responding to these concerns also. It implemented operation in low noise mode with this type of turbine. That is an option you can slow the rotor down.

You pay a penalty on the electrical output but you do get a reduction in the noise output. There's also some work in progress. You saw in Charles Newcomb's slide, the serrated edges added to the trailing edge of some wind turbine plates, that is being - that technology is being beta tested by General Electric on the wind turbines at Fox Island.

There's been a lot of activity in this area on this project and the Fox Island Cooperative hopes to publish all these reports early next year. So - and that'll be good to see how that all shakes out.

And really just for some conclusions and observations, do the rigorous analysis, you know, do it early. It can help you avoid unexpected impact. Focus on the planning stage for your mitigation wherever possible. Engage the public early and often.

And even when you - even after you get through the permitting process, let them know before you start construction because that may have been part of the issue in Falmouth.

Steps taken to mitigate impacts will certainly affect project economics if they're too drastic so take that in mind. And finally, you know, impacts on the mitigation steps, you know, especially with sound and visual, it's in the eyes or ears of the beholder and in some cases, there's no right answer for everyone. So that's a challenge. So thank you all very much.

Robert Grace: Thank you Nils. (Sue), if you could back up my slides. And so we have a couple more things to do really quickly before we go to Q&A. First of all, just a reminder that the Webinar materials, Power Points, as well as transcripts and the questions that will be asked by participants will all be posted by December 21st on the New England wind forum Web site.

As I mentioned earlier, this is the last funded Webinar for NEWEEP. The original funding is no longer available. Participant feedback so far has strongly supported the need for what NEWEEP has attempted to do, the need for continued forum that's focusing on fact based information and exchange in a fair and civil manner.

For such an effort to be successful, it's motivation. It's concept. It's funding. It's oversight. It's planning. It needs to come from neutral sources, sources that are perceived as neutral. So going forward, there are efforts underway to establish funding for some form of continued effort through New England Wind Forum and NEWEEP or some related projects.

And we very much would welcome all participants' input on the next steps. What content should we be focusing on? Are there topics that need further exploration and where there's a need for more information?

Is the focus right? And importantly, what - about potential funding mechanisms. What funding mechanisms would be available and not perceived as changing the objectivity? NEWEEP has not taken funding from any wind developers and manufacturers. We felt that's important for that perception but it also makes it challenging in this environment where there's little government funding available to figure out how to provide the information necessary.

We will be distributing a post-Webinar survey afterwards and we encourage you to participate and provide us with feedback. As far as keeping in touch, the conference proceedings from the NEWEEP conference earlier in June are all online on the New England Wind Power and New England Wind Forum site and will continue to be a source of information for the project and for additional information going forward.

And if you wish to receive announcements or offer suggestions, please sign up at the links shown here and do - consider signing up for the Wind Powering America newsletter which is available. You can sign up at the links shown at the bottom.

So at this point we're going to turn over the floor to the questions. Again, we have 24 questions queued up. Please go to the Q&A and enter them. Remember to click Ask after you type it so that it does show up and we can ask it. If you've started typing we can see that you've done that but we can't see your question.

So again, please introduce yourself or just say your name, your organization, where you're from when you're posing a written question. And I will start reading them through. I have a couple of questions that were posed and one or two that I'd like to ask throughout if we get fairly far into this and that we haven't teed up. I may slide a couple of those in.

So I'm going to go to the Q&A. And the first is from (Glenn). Had a question about air rights. Has New England addressed this? For example, if a turbine base is on one owner's land, what are the rights of the adjacent land owner when the blades are over the second land owner's land, and maybe related to this, maybe offset requirements so that that doesn't occur. Do any of the panelists have any experience in response to that?

((Crosstalk))

Charles Newcomb: Well, this is Charles. I would suggest that with a 700 foot setback or more, when you've got a rotor that's, you know, 300 feet across and that means a radius of 150, that would be really hard for that blade that's 150 feet to reach 700 feet to the next landowner's point.

I guess that's assuming that it's 700 feet to the land and not to the house. But it's unusual for anyone to put a turbine that's, you know, less then 1.1 times the tip height from either property boundary or a structure that doesn't belong to them.

And if that's the case, then that's less then the blade length. So I would suggest that that's probably not going to happen.

Robert Grace: Great. Thank you. The next question is from (Richard Zewinsky) from the town of Sheldon, New York, a resident there. And this is an individual who

has been seriously negatively impacted by the wind turbines that Supervisor Knab was talking about.

We were told by Mr. Knab that there was no mitigation or mediation available in our town and to contact the wind company directly which has proven to be futile. What we'd like to know is if Mr. Knab has decided to change the no help for homeowners policy in the town and will be assisting homeowners like us who may have to abandon our homes due to negative impacts.

We'd be happy to provide sound study results proving that the noise violates the town wind energy conversion system law and other documents to any interested parties. So we have an aggrieved abutter and Mr. Knab, do you have some response to that?

John Knab: (Unintelligible) to this individual and told him that he has to provide sound information by a certified technician and certify that it's over 50 decibels and then the town will act on it.

At this point they have not provided us with any information. (They) thought the town should pay for the technician should come in and do the sound testing and we said, "No, that was up to the landowner." That's where it stands at the present time.

Robert Grace: Okay. Thank you very much. The next slide here, will the slides be available to us after the presentation? Yes, they will be posted at the New England Wind Forum by the 21st of December.

And is there research data on noise compliance depending on manufacturer and model of turbine? So do they - is there a difference, perhaps, between the noise produced by manufacturer and turbine model? Is there reason to believe

the noise complaints are higher with certain machines? And also is it possible for you to tell the audience that the - person asking these questions, who's (Tom Stanton) at the National Regulatory Research Institute is working on a white paper about wind sighting and zoning for all 50 states.

So I think I just did that. And he invites participants to email him and ask for a copy of their state summary. They'll need help checking to make sure they're getting the summaries right. There'll be a list of people who want to see the finished paper and so forth. So Mr. (Stanton) can be reached at (tstanton)@nrri.org and that information will also show up on the Q&A which - the questions that were posed will all be posted on the Web site.

So back to the initial question to the panelists. Is there research information that talks about noi- or provides any information on noise that might be different for different manufacturers in turbines?

Charles Newcomb: This is Charles again. So I would indicate that I'm not aware of a comparative study but if you look at the specifications for the turbines, they're all landing at about 103 sound power level equivalent - 103 decibels. And that's, you know, a theoretical point in space and (eminator) that's, what, a half a meter in radius or something like that.

So they all have almost identical sound emission levels. And that's being driven by the market. So today they're pretty uniform. In the past, oh boy, you know, they were very different. We had turbines that were nearly silent and even in the small wind world, still today you have turbines, depending on their regulation mode, certain residential turbines that are (install) regulated and very quite with electrical breaking versus a (ferling) turbine that kind of turns its head out of the wind.

Really different sound signatures and sound parallels, so that's true for small wind but not so much for big wind. The exception to that is when you have somebody who has, like, Fox Island where they've actually got the blade treatments that we talked about installed. And those will be quieter then the comparative (1-5) without them.

Robert Grace: Okay, thank you. Any other response from panelists or shall I go to the next one?

Man: Go to the next one.

Robert Grace: Okay. The next question is from (Peter) in Massachusetts and he asked how do all the mitigation payments effect the overall costs on the rate payer base and therefore the overall economic viability of wind investments as opposed to other energy alternatives like natural gas, coal, oil or solar? Nils, do you want to try to take that one?

Nils Bolgen: I guess mitigation payments for a large project that has, you know, maybe ten up to 30 or 40 wind turbines, a project like that can probably bear a greater level or, I mean, absolute dollars of mitigation payments without adversely affecting the project economics. It becomes much more challenging, though, when you have a smaller project with just one or two wind turbines.

Robert Grace: Okay. The next question is from (Callie) in Boston and (Callie) asks do trailing (egg) serrations produce a 3 decibel reduction in sound power or source levels or in measured sound pressure levels some distance from the source? So the question is, is that a 3 decibel reduction that Charles talked about at the source or at the receptor? Charles.

Charles Newcomb: Typically those sorts of mitigation elements are described in terms of sound power levels. So they're from a theoretical source not - I mean, you can't really decouple the two but, yes, typically as it were an (eminator) so if it was 103, it goes down to 100. And that's where you start from, from a theoretical basis.

Robert Grace: Okay great. The next question is from (Kathy). She asks, for mitigation the effects on aviation species, how far from important (bird) areas, the last stop in the fall migration of many nocturnal songbirds and marine species should turbines be placed?

Charles Newcomb: This is Charles. I don't think that can be answered because I think it's too site specific. You know, it all depends on what's happening, what's - what are the driving forces on their migration routes. So they may be hooking around a lake and so they might be pulled closer to the corner of the lake then further around the corner of the lake.

So - and then they could get blown off course by wind, so who knows? That's a good question for biologists but not a technologist. Sorry.

Robert Grace: Okay. Thanks for trying. Okay, the next is from (Dev) in Wisconsin who asked how do you address concerns that the approach of getting everyone on board through neighbor or community payments is just trying to buy people off? Some people, for example, have expressed that the noise will always be a problem and that money make - won't make the problem go away.

You seem to contract this with your name across the crowded room example. But I'm sure this is addressed to the feeling that wind noise is different from other types of noise. So, Charles, I think that is directed at you.

Charles Newcomb: Yes, I think there is a big difference between a noise that is kind of persistent and a noise that comes and goes. That's for sure. But I think, you know, a highway is a nice example of a noise that comes and goes. Sometimes it's noisier then other times.

And if you had - if you - if it was against all of your best wishes to have that highway placed there and it ended up there, it would always drive you crazy. And so there - you know, it - that's where I say it's attitudinal to a degree, that yes, sometimes you can take a decibel meter and say, yes, you're over the line, sorry. You have to mitigate that.

But other times it's astonishing how perceptive people can be. So in cases where people are really concerned about the sound emission from a turbine that's 2700 feet away in a neighborhood where you just would have to work so hard to hear it, it's really hard to - that's a difficult thing for a developer to hear.

It's, like, "Really? That's driving you crazy? And you can ignore all the dogs and cats and cars and helicopters and all the other things around you? But I agree with you, if I really listen for it I can hear it." Well, that's what they do.

They're annoyed by it. They're unhappy with it and they can never turn that annoyance off. And so you're not going to get everybody. You're not going to turn everybody around and there's always going to be one or two people that no matter what are going to be unhappy. It's not Shangri La.

And that's just unfortunate. But it's also part of sharing a planet. That - the anecdote for me was a situation where we had 2500 folks on a nearby county and 7 people didn't want it in that county. It didn't happen. The project didn't happen.

And it would've been hundreds and hundreds of thousands of dollars of revenue to that county. And that didn't happen. Well, those were a handful of people that prevented the country from coming out of this extreme poverty that it was in.

So it's not really buying them off. It's sharing the benefits of a new form of generation and provides lots of benefit and not just clean power but economic benefits as well. And there're a lot of other impacts and resources and activities that humans do that don't have that kind of an attribute. And I think it's really important to see it in that light.

Robert Grace: Thank you Charles. Just, you know, because this is an important topic that I've heard come up frequently, this different perception of neighbor payments or abutter payments to compensate people for impacts versus the perception of buying them off. I just wanted to see whether Nils or John, you had any comments you wanted to offer on that topic as well.

John Knab: No not really. This is John. I have - no.

Nils Bolgen: I thought Charles said it very well.

Robert Grace: Okay thank you. Okay, let's go to the next one here. So this is from (Hillel) from AKRS. The other examples of large rays of small scale turbines such as building integrated machines - I'm thinking of a situation where putting in tall towers may not be feasible but existing structures if sufficient height are available. Any thoughts on that as a - I guess as a mitigation technique?

Man: Well, I thought the example of (dear Allen) was a great example. I wouldn't call those small building integrated turbines. But that's an example of

sometimes you need to literally get under a radar and more smaller turbines is a solution.

If they're getting at the point of, well let's put in 101 kilowatts or 1001 kilowatts or 1000 ten kilowatt turbines, no, folks generally don't do that because there's a pretty steep curve that describes the cost per kilowatt installed and small turbines can come in at, you know, $4000 or $5000 a kilowatt.

And big turbines are coming in far less then that. So it just wouldn't work economically to do it that way.

Robert Grace: Okay. We have a related question I think from (Dick Adams) the - on the Middletown (Reallen) Planning Board. And (Dick) asks, can someone talk about small wind, under about 60 feet, and its impacts? What are the impact variables that should be considered and what are the specific limits?

Man: I feel like I'm taking a lot of these. Is that okay?

Man: If they're - they seem to be aimed at you so far, so.

Man: Okay. Yes, the - towns have - a lot of towns have small turbine zoning ordinances. And they speak to setbacks just like they do for big turbines. They speak to sound levels just like they do for big turbines. And more and more there's something that hasn't come up at all in this call so I feel a little bit bad bringing it out of context.

But it's the notion of certifying small turbines and sort of the UL sticker equivalent, to know that it's a safe piece of equipment that'll be productive and will hit the performance goals that it's supposed to hit.

And to that end, there's a called the Small Wind Certification Council that looks after small turbines and certifies them. It's a new body that was formed in the last five or six years and has the first turbines that have now been certified.

And so some ordinances are beginning to look to that and certainly state incentive groups are looking at making sure the turbines are certified so that nobody's putting up home built turbines where they shouldn't be put up. Not to say you can't put up a home built on a farm or you're not going to impact anyone but yourself.

But it's really trying to ensure the safety of the neighbors. So, yes, there certainly are similar ordinances for small as there are for large.

Robert Grace: Okay. The next question is from (Mark Maynard) of Urban Power in Massachusetts. And he asked, has anyone tried to couple these large turbines with smaller vertical access turbines that are quiet, burden (back) friendly and work well in lower wind speeds and can be located lower to the ground to increase power produced by wind farms?

So I guess he's talking about perhaps a blended installation that might have larger turbines further from property lines and smaller vertical access turbines closer to abutters. Is anybody familiar with efforts along those lines?

((Crosstalk))

Man: Sorry. Go ahead.

Man: Yes, I have no experience at all with that, so.

Man: Well, as a former agriculturalist I have to admit, I like the image of the (perma) culture for wind power. It's a beautiful image. The fact is, is that there - the best winds are up high so when people are trying to make a utility power for sale in a utility - competitive utility market where you're competing against coal and natural gas and other forms of very inexpensive depreciated power, now it's - you want to - you typically want to get your wind turbine as high as you possibly can.

And that's the larger rotors on the taller towers. The place for small towers and small turbines is when you're offsetting retail rate power. So they make a lot of sense because retail, they can be three times or two times anyway what wholesale power is and three times what the (best bar) price is for utility scale.

So, no, nobody that I know of - there has been some interesting work in Southern California where they're doing a ray of vertical access machines but I think those results are still forthcoming.

Man: Okay.

Nils Bolgen: I have one thought on that. This is Nils, so - although it's not a vertical access wind turbine. I didn't show a picture of the third wind turbine installed at the (diarom) and waste border treatment plant.

That turbine is a demonstration model of a new design. It's horizontal access but it has a shroud mechanism up around the rodar - rotor. And the purpose of the shroud is to concentrate the airflow into the rotor swept area.

The notion there is that you get higher wind speeds across your rotor and therefore you have a higher energy production for a given sort of general ambient wind speed.

It's quite an interesting design. It, you know, it may be more friendly to birds because the large shroud is certainly much more visible and it allows the - conceivably a smaller wind turbine to produce as much energy as something that might be a bit - or substantially larger.

Robert Grace: Great. The next question is from (Annette Smith) from Vermont. And she raised the question, Vermont has approved two wind turbine projects with 459 foot tall wind turbines, one with 155 foot setbacks from property lines, one with 196 foot from property lines. Is this safe? And what are the speakers' opinions of these setbacks from property lines especially since they're on top of mountains where there will be icing and ice (thorough).

And here actually this brings up a very important distinction. We've talked and heard about setbacks. One of the key questions with setbacks is are the setbacks measured from the turbine to a property line or are they measured to a residence or to a receptor?

And so why don't I put that first to Nils and then anybody else who would like to respond.

Nils Bolgen: Well, in a - you know, a rural or a forest setting, it does become I think a different equation then in a community type setting. Certainly you want to be concerned about distances to an occupied building or a residence or an area of common activity.

Really the only thought I have is I'm familiar with one project - one ridge top project - that has a snowmobile trail that goes through the project area. And I believe that they have to work out a system for closing that trial or providing and alternate path at times when there may be icing on the blades.

But to me it all boils down to what type of activity is there in - within that vicinity, perhaps less, you know, where the property line lies.

Robert Grace: Okay. John or Charles, do you have anything you'd like to add to that?

Man: I like the perspective that it's about risk and it's about activity. When we were installing turbines at schools, there was often the concerns, well what about when the kids are playing underneath the turbines or having a picnic under the turbines? Are we worried about ice?

And when we pointed out that, well, you know, do your kids typically have picnics under the - in that field when the trees are full of ice? And the answer is, "Oh yes. Good point."

So a lot of times it's connecting the dots and understanding that, you know, they may not be coincident events, that sure, it's really about risk and what's the risk to property damage from falling ice? Oh well, if you're over a Mercedes Benz parking lot, that's one thing. And if you're over woods where you have ice fall from the trees themselves, that's another thing.

Man: Okay so, you know, if these are mountains that are used for - snowmobiling was a good example or hunting or hiking, those are part of the uses that might be factored into the equation?

Man: Absolutely. Very site specific and very use specific.

Robert Grace: Okay. Great. The next question is from (Jay Silva), Silva Energy in Massachusetts. And he asked how has the noise and vibrations been for the neighbors? I guess, why don't we start with John and that seems to be the most specific project to react to.

John Knab: As far as vibrations, you don't, you know, it doesn't matter if you're standing right next to the turbines or, you know, 1200 feet away from them. You don't feel any vibrations. It's always - it also depends a lot on, you know, if you are downwind from the turbines or upwind, it cuts down the noise considerably.

And like I said before, I know myself we have three that's, oh, a third of a mile from our house and I guess you can hear them at times. You have to listen to hear them, but you know, it's not a real offensive noise.

And I don't, you know, we haven't had other then one or two people, (as far) as what's complained about noise.

Man: Okay.

John Knab: No, we don't have a lot of noise.

Man: Nils, since you were talking about some specific projects, any reaction to that question?

Nils Bolgen: Just to reiterate, I think that, you know, it's very subjective. I don't recall if I mentioned on the Fox Island's project up in Maine, it's an old established working community, you know, lobster fishing and things like that.

(I) used to do quarrying there. For the folks - many of the folks who are - who can hear the turbines but are very concerned about their electric rates, you know, they're comfortable and it doesn't bother them.

There are others who maybe have moved to the island and it's more of a refuge type setting for them where peace and quiet is probably much more highly valued. You know, they will experience the sound differently and react to it probably more negatively. It's highly subjective.

Robert Grace: Thank you. We have another question for John Knab. This is from (Deborah) from Massachusetts. John, do you know if there have been other calls to the hotline since the first year of operation and if so, what's been the nature of those calls?

John Knab: Yes, there're two individuals that talk quite frequently the last couple of years with the same complaint - noise. Names like maybe greed and jealousy has a big part of it, that they didn't get any money for being within 1200 feet or (there have been) - 1200 feet. The one individual the turbine was moved, so it was not - he would not sign off so the turbine was moved to make it more then 1200 feet from his house, so.

And the other in - it's over 1200 feet and his house is almost directly under a power line, a 440 power line that he calls regularly complaining about noise. I - you know, either one has failed to get a sound test study done.

Robert Grace: Okay. Thank you. The next is from (Seth Steinman) of People's Power and Light in Rhode Island. And he asked, how do you recommend responding to blatant misinformation and lies by opponents of wind turbines? In one instance, (Politifact), the Pulitzer Prize winning organization rated their statement a pants on fire lie.

And while responding to that, I guess I would ask, you know, that, you know, how would you apply that if the - if misinformation was put forth by project proponents as well? Anybody want to take that one first.

((Crosstalk))

Man: I'll give it a try...

Robert Grace: Okay, why - Nils, you want to go first?

Nils Bolgen: Sure.

Man: Okay.

Nils Bolgen: I try to get across the point that, you know, community engagement in the planning stages is very important. One thing that project developers and municipalities or host communities might consider is engaging professional neutrals, facilitators, if you will, in the process.

Some neutral third party that can help sift through the information and I don't know if they would categorize it as a, you know, pants on fire or highly credible or something in between but just some neutral third party to help out the process.

Robert Grace: Thank you. Charles, did you have something you want to attribute to that?

Charles Newcomb: It was one of those situations where I couldn't do any better then that. That is exactly the right thing to do, is find somebody else who will evaluate it

for you and actually say, "This is truthful. This is credible. This is scientific base. And these are - this is misinformation or (malinformation)."

And really call a spade a spade because, you know, when you're looking at a public, you know, a sighting or an ordinance or you're looking at some sort of a project that requires public approval, really there's - that's not a place where you should be introducing false information into the equation.

It really should be based on fact and I think there's just something abhorrent about trying to fool people.

John Knab: This is John. We had quite a bit of that during the sighting preps (here) and our engineering firm, you know, proved most of it wrong. It just seems that, you know, people get information. They can put anything they want on the Internet and everybody else believes that it's gospel or something.

And no, it's - I know here and another project, (Abert Duff), it's unbelievable, the remarks that come out of people and, you know, they print in magazines and papers and stuff that, you know, (it's) just not true.

Man: And Bob, to your point earlier, it's just as wrong if people completely downplay the impacts. There are impacts and - but they're manageable and so it really needs to be based on balanced information.

Robert Grace: Thank you. The next question is from (Dan Webb) in Falmouth, Mass. And he asks, for Falmouth, are there other mitigation options such as serrated blades or reduced power operation during high winds being studied? I guess that would be one for Nils.

Nils Bolgen: Not yet but one of the things I didn't mention is that, you know, well the town has their consulting team looking at these mitigation options, you know, retrofits to homes and things like that.

(Noss) Clean Energy Center is also providing some consulting resources to the town, specifically to the board of (selectmen) that have - that are trying to help deal with the issues there.

We're providing a - sort of a wind technology consultant and an acoustic consultant. And I think when we get all these teams together, I think there'll be an opportunity for some freewheeling brainstorming to consider what types of additional options should be looked at. And maybe that one comes about.

Robert Grace: Okay great. I've got one that I've been saving up here that I'm just going to slide in. We've heard speakers talk about a number of mitigation techniques that really apply broadly to the community. They're mitigation benefits to a community.

And isn't that less then compelling to the abutters who might be disproportionately impacted? So what can be done about those that are disproportionately impacted? Perhaps Charles start and go around the table.

Charles Newcomb: Yes, we discussed this briefly. That's the notion of the neighbor payment as opposed to some payment in lieu of taxes. The payment in lieu of taxes would be for the community itself to acknowledge that there's a, perhaps a visual impact but not from a shadow flicker perspective or anything else.

But just that it changes the landscape and that might be worth something. And the neighbor payment is more about, you've got somebody who's closer to the

project who may be effected perhaps not above a health threshold but above an annoyance threshold.

And it's worth acknowledging that and if you have it in the mitigation budget - quote, unquote - to do that and the project still works, then that might be worth something - worth considering. So we've definitely seen that. And, again, in the context of our earlier comments, it's not a buyoff and it's - that's not what it is.

It's really an acknowledgement that there is an impact and, yes, let's make it right with you. Sometimes it's just easier then other things.

Man: Okay.

John Knab: This is John and in our case, people that, you know, had problems with the flicker, they installed either Venetian blinds or drapes on their windows that were affected. And, you know, pretty much the landowner's discretion what they wanted.

And as far as TV reception, it was - they installed dishes and paid for the yearly basic cost. Every January, you submit a bill to them for - or your first bill and they reimburse you with a check for the full year's service, so.

Those are the problems, and as far as sound, the individual that - they've bought pine trees and planted pine trees for some individuals. Other individuals they give them the money, they buy the pine trees and which never happens. So this is, you know, things you learn. I guess they should've planted the trees.

((Crosstalk))

Robert Grace: And is it the idea with the pine trees that they absorb and mitigate the sound, (block) sound?

John Knab: Yes. Yes.

Robert Grace: Nils, do you have anything on this one?

Nils Bolgen: No, I think that pretty much covers it other then, you know, neighbor payments. I've seen examples where they've been proposed and they - the payment amount of sort of proportional to distance on the project.

Robert Grace: Great. Let's see, the next question is one - I think it's been addressed already so I'm going to move to the following one which is from (Greg) in Massachusetts. Can you comment on low frequency sound wave impacts and efforts to mitigate? Anybody want to take that first?

Man: That would sort of fall into the category where it's really hard to modify. We've had a hard time - our industry has had a very hard time finding evidence that that's a real health issue. I think you can find instances where some people may have been annoyed and - but those people who may be annoyed from the (infra) sound from a wind turbine, would also be annoyed from the (infra) sound from the highway, for example.

Their - the world is awash with low frequency noise from sources all around us. And it travels great distances and it's very difficult to suggest that a project is going to tip that individual over the threshold, you can point it all to that one project.

And I think that's where the biggest concern or biggest difficulty is, then it's actually saying, yes, that project did it. So, no, given that it's - that it hasn't been proven yet as a real issue - credible real issue that has been signed on by - within a couple of doctors - you can always find a couple of doctors to say something, it hasn't been a focus of anyone's real attention other then to say, hey, this is a real issue.

Robert Grace: Okay. Anybody else want to - Nils, do you have anything to add to that?

Nils Bolgen: I'll just add that in Massachusetts we have the Department of Environmental Protection and the Department of Public Health have convened an expert scientific panel to review acoustic issues associated with wind turbines.

And their report is expected before too long. I don't know for sure how much that gets into the low frequency side of the spectrum, but it'll be interesting to see before too long.

Man: I know they took a lot of public comments on that and I'm sure I remember seeing some comments on low frequency being posed, so hopefully that's something they address in their scope.

Man: Probably hard to ignore.

Robert Grace: Okay, so the next question is from (Jim) who asked how active is Massachusetts Wind Wise been in opposition to various projects in the pipeline? I guess I'd target that at Nils but at the same time I'm not sure we really want to be (winning) anybody out here. That's - is there anything you'd want to say to that Nils?

Nils Bolgen: We see a lot of the press reports and speak with our grantees or our loan recipients about how they're doing in their permitting processes and, you know, there's a wide range of folks that participate, provide comments. The Massachusetts Wind Wise name crops up fairly frequently. There are others also.

Robert Grace: Okay, thank you. The next question is from a (Chris Capsenbelis). I hope I pronounced that correctly, who asked, how is the ten rotor diameter restrictions instituted that the Cape Cod Commission going to affect future installations on Cape Cod? Nils, I think you're probably best suited to address that.

Nils Bolgen: Okay, the way I understand it, the ten rotor diameter rule or guideline is - that's the threshold within which the project needs to be subjected to detailed review of acoustic or shadow flicker studies and things like that.

The proj- if the project was proposed and it was beyond ten rotor diameters from in any residence, then presumptively the project would not have unacceptable acoustic or shadow flicker in (fact). I'm not sure actually on Cape Cod whether there are any locations where that might occur but it's not a prohibition against projects closer then that. It's just a threshold for more rigorous analysis and permitting review.

Robert Grace: Thank you. So I know we've gone beyond our time. We have eleven questions left up on the Q&A board. I do want to just ask the speakers if they're willing to stick around and go through a few more. We still have 129 listeners on so clearly people are engaged in listening to the Q&A. Is anybody okay with trying to get through another ten more or so and then we'll cut it off there?

Man: Sure. Yes.

Robert Grace: Thank you. We all appreciate that. This next is from (Suzanne) in Massachusetts. What has been done about understanding health issues, suggestions on how to calm fears of health problems and wind turbine syndrome?

I don't know - I think perhaps Nils, your comment there on the - in the Massachusetts DEP and (the) health study is perhaps one answer to that. Does anybody else have anything they'd like to offer?

Man: Well, the American Wind Energy Association has weighed in on that and - but, you know, that's one of those things where you say, "Well, where's the money coming from?" So despite their best efforts, the - to find independent folks, they're always going to be swimming up a stream with answering those kinds of questions.

So I think that's a good space for us to step in and we've definitely - the Department of Energy and the National Renewable Energy Laboratory has weighed in to a degree, you know, and said, "Well, let's look at the research," and it's - the wind turbine syndrome, again, it's a bit like epilepsy from wind turbine shadows.

Sure, there's a chance but it - how real is that chance and what can we do about that? There is a special report on (unintelligible) sources and climate change mitigation. It was - and they got a governmental panel from the working group a few years back that we can make public at the conclusion of the Webinar.

Robert Grace: Okay, thank you. Next question, we have two questions from (Kathy Karch) from Salem (Safe) in Massachusetts. And one is how closely did the energy production and money generation estimates for these various projects align with actual production numbers when the turbines went online? Did any projects under or over perform early estimates from companies and why?

Nils, do you want to talk about that one since this is a Massachusetts question? And then Charles, you can - Charles and John, I'd appreciate both weighing in.

Nils Bolgen: Sure. We do keep track of the energy production from the projects. (We) receive finding support from the Clean Energy Center. And we - I think not surprisingly, we see a range of outcomes in terms of actual production compared to what might've been predicted in the planning studies.

And we've been at this for a long while so one of the things we do to try to get a better alignment between the two is we've instituted various methodologies for the preconstruction analysis on, you know, how to measure the wind resource and estimate the long term wind resource and things like that, all (assigned) to try to get better upfront estimates.

Charles Newcomb: So on - as an industry, we've had some disappointing news recently in which we found that systemically, yes, some - we have discovered that estimates can be a little bit higher then reality. And that has nothing to do with people inflating what they think they're going to get out of a wind project because they're trying to get better financing or something like that.

It has - it's being pointed to ne- room for improvement in our modeling techniques because getting the exact nuances of how surface roughness has an

interplay with the atmospheric conditions above is - there's still room for improvement there.

So we're getting to - we're beginning to make that bias go away but it's going to be there unfortunately because we can't be perfect. And now that we know that that's an issue, and it's in the order of less then 10% but more then 5% is my understanding from an industry perspective.

But now that we know it's there we can make immediate corrections to the bias and then figure out what - where do these errors come from? There's a great resource assessment workshop next week in Seattle in which this is the Thursday conversation - it's what's going on and how do we fix that?

But there's also, you know, there're so many factors in being able to predict it and, you know, we just went through the longest negative North Atlantic oscillation index for - since 19- mid 1960s or so. So that can be part of...

Robert Grace: What does that mean Charles?

Charles Newcomb: Sorry.

Robert Grace: What does that mean?

Charles Newcomb: Oh, it's the La Nina, El Nino kind of equivalent in the North Atlantic. And that's going to drive the direction that the wind goes and the strength of the wind in the Eastern seaboard. And so those kinds of things are coming into play where we have these long cycles.

And we may be riding through, and that's an example of a long cycle that was 30 years, 40 years in the making. So we'll see if our bias goes away in the

next couple of years but being dead on with a model, that's really hard to do with as complex as the systems that we're trying to model.

Man: I think I'll weigh in on this one a little bit. I was involved in a project recently taking a look at historic performance of some wind projects. And one thing that I learned from the literature was that prior to about 2009, the industry as a whole seemed to, for a number of different reasons combined, had a roughly 10% on average shortfall bias in estimation.

The industry has largely corrected for that so that while there may be variation of expectations, it doesn't ta- the - most of that bias is gone away or been corrected for in current projections going forward.

So it's important that 10% was average. Some project were - (as works with) averages, some projects had been far worse then that 10% off and some had been better.

Man: You know, the one thing I would add is that we've gotten a lot better at forecasting short term. So our ability to integrate wind with a grid in a smooth and predictable fashion has gotten so much better then our error in that 10%.

Robert Grace: The next question is from (Alex) who asked is it possible to connect a battery to the turbines and use the battery at the power outage? Is the real practice operating like this? Just for a matter of time, that's really not in our target thing in terms of mitigating public acceptance issues. So what - in the interest of time why don't we skip over that one?

The next one is from John who has a two part question. What is the scale for evaluating wind site production? And what is the likelihood of a commercial developer proposing a project on a (marginal) wind site?

Man: What do you think they mean by scale? Like, spatial or is this time or? Well, let's answer the second one and see if that gets us to the first one. It's - there's a lot of room in the industry right now to develop good projects.

So there're some interesting artifacts out there like, well, how much more is this going to cost you? Well, if you ask developers, "How much are you willing to pay for this," they all have a number in mind that it's, you know, less then 10%, 15% or something like that that they're willing to pay on a premium for something else.

And then they won't pay it anymore. Why? Because they go elsewhere. So I think, you know, right now it's kind of a buyer's market in terms of developers that they can go and develop projects elsewhere so they tend not to develop marginal projects now.

As we see development proceed in the future and the easy and the high margin sites are long gone, then we'll start to see movement into marginal. If anybody's developing a marginal site, they have other reasons for doing it. So I would suggest, you know, certain projects like community projects, that are in less then stellar wind resources, that's because they - there's an educational value or there's something else.

I know projects where there's a 20 year payback but the community's just find with it because they are really onboard with the notion that wind energy is part of their future.

Robert Grace: The next question is (Chris) from Massachusetts and he asked, doses the Fox Island project have a design goal for noise reduction for the blade retrofit?

How is the success of the retrofit going to be evaluated from the noise standpoint? So are any of the speakers familiar with that?

Nils Bolgen: This is Nils. That's a level of detail I'm not familiar with.

Charles Newcomb: Yes, I mean, I - this is Charles. I would agree that that's a project specific detail that I'm unaware of.

John Knab: Yes, this is John. It's the same for me too. I'm not aware of the (object at all).

Robert Grace: Okay. Four more questions. (Paul) from Massachusetts asked for mitigation payments are there established rules of thumb or best practices for determining distance from turbine eligibility? In other words, how do you establish a practical radius? Good question.

John Knab: This is John. On ours, if it was less then 1200 feet from the house to a turbine, you got a payment. It was a fixed one year payment or one-time payment. And I'm not sure what the exact amount was but it was, you know, just a one-time payment, as far as, if you just had a flicker or anything like that, that was just a one type deal also, so.

Robert Grace: Okay. Others.

Charles Newcomb: I would suggest that it's very location dependent. So if you're in an area where it's really quiet, right, and there's no background noise, then perhaps that 1200 foot number might stretch.

If you're in a marine environment where you have a lot of surf noise or you're near a highway or something else or other sources of noise, background noise, then that 1200 foot number might be retracted back. So it's really on a

location by location or pixel by pixel basis that most of those decisions would be made on, I would think.

Man: And wouldn't that also be a function of how big the project or how tall the turbines are as well?

Charles Newcomb: Exactly right.

Man: Nils, anything to add to that?

Nils Bolgen: No.

Robert Grace: Okay, next one is from (Jonathan) who asked, earlier (Peter) asked the question about effects on (ray pairs). There was a comment about mitigation payments but the question was not answered. What are some examples of kilowatt costs over the life of the contract, how do these rates compare with present costs for other renewables as well as natural gas? So that sounds like it's a question about wind energy economics in general as opposed to the cost of mitigation. But is there anything there anybody would like to respond to? That sounds like it's a question for a different Webinar.

Man: Bob, I - maybe I can recover a little bit from - if I missed the question in the first try. I guess is, you know, if the mitigation is done at the planning stage, the developer is going to factor the costs of the mitigation into the overall project cost and - which in turn informs what the facility needs to sell it's power for, if it's a wholesale or commercial type project looking for a long term agreement with someone to buy their power.

It might have a small effect on that. And whoever's buying the power, that would parlay it into a slight impact on the customers. If it was a net metering

type project where the - in that case the cost to the electric rate payer in Massachusetts is probably established by the existing electric rate structure.

So in that ca- situation like that, you know, the level of mitigation payments or reduction in the scale economies of the project, that would just translate into an impact on the financial return for the sponsor of the project.

Man: So Bob, another thing is that next week we've got a Webinar on wind power economics - past, present, future trends. So that might also be a great opportunity for that.

Robert Grace: And how would our listeners find out more about that?

Man: If they go to Wind Powering America and there's a green bar across the top and they can go to the wind program, so ERE wind program, Wind Powering America information resources. And then they'll get to the Webinar podcasts. And in the upcoming Webinar gray box on the top right, it's a link to the wind power economics.

Robert Grace: Great. Thank you. All right, the next question - and the second to last one - is asked by (Brian) in - (Brian Clark) in Massachusetts who asked are the noise specifications for 100 kilowatt sized turbine the same as the large ones, 103 DBA stated earlier? Actually the 103 DBA, was that the sound pressure at the source?

Man: Yes, that was the number, right, if you look at the (Siemens) spec sheets and the GE spec sheets, et cetera, you'll see that 102, 103 number that comes up. And the northern is a little bit quieter. If I remember, I think it's 100 DBA so it's half as loud but it's also quite a bit shorter, so in fact, you know, it still needs to be sited not quite 700 feet away but it needs to be sited not

immediately adjacent to abutters who aren't supporting the project ahead of time.

Robert Grace: All right, thank you. And I guess the last question is from (Peter) in (Tipperton), Rhode Island who asks, should a site have a benchmark of a background noise level before the turbines are installed on a site?

John Knab: I know - this is John. I know and I - project here, the developer did testing for sound before they started to do any construction at all, get a - what the background noise is and then after the turbines were up and running, another test was run and it was all below the 50 decibels at the property lines, is where they took the readings.

But no, they did do a background noise test before the turbines were installed and they did, I think six different locations, that project, for sound, some (area) main roads, some right out in the field, you know, (unintelligible) a mile from a road and took the readings for that and compared it with after the turbines were up. That's all I have.

Man: Bob, in Massachusetts that's a very important step for many projects because our statewide noise regulations are - limit increases in noise caused by some device - in this case a wind turbine - over the ambient sound levels.

And ambient sound levels are very location specific. If you're in a quiet rural area, it's going to be a lot lower then in a suburban or an urban type location. So doing a pre-construction, pre-permitting ambient study and then doing the modeling of the wind turbines proposed, layering that on top of the ambient noise study is very important.

We - it just - almost as an aside, we require that in many cases for wind project feasibility studies that we fund and we're on the verge also of releasing a standardized methodology for doing those studies because we've seen a bit of a range of methodologies used and we want to get them all standardized. So that's something that we have going programmatically.

Robert Grace: All right, well, we've gone through our questions and I'd like to express thanks to our speakers for their participation today as well as their patience and willingness to stay on for extended time through all of the questions and answers.

We even still have 100 attendees on so clearly there is a lot of interest and thirst for information and interest in getting answers and learning from others' experience. So we thank you very much for contributing to that dialogue. We thank the listeners and participants for listening through and asking a wide range of very good questions.

Hopefully the answers have been helpful. And again, I'll thank everybody for participating in the NEWEEP project. Hopefully we'll have an opportunity to continue offering these Webinars in the future and I encourage everybody to follow up and respond to the post-Weinbar survey which will be sent around shortly.

And again, thank you to the folks at NREL for operating and hoisting the Webinar.

Man: Thank you Bob.

Robert Grace: Take care.

Man: Yes, take care.

Man: Thank you Bob.

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